Navigation Economic Technologies
NETS

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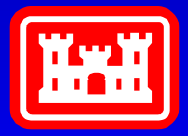


NETS Goals:

- The goal of NETS is to advance the Corps world-class engineering with state-of-the art tools and techniques for economic modeling and analysis.

NETS Team

- Includes:
  - Academics from seven universities
  - Representatives from
    - Oak Ridge National Laboratory
    - Tennessee Valley Authority
    - Corps Centers of Expertise for Inland and Deep Draft
    - US Naval Academy
    - Institute for Water Resources

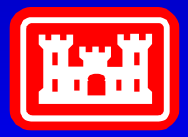
Activities

1. Theory
2. Estimation of shipper response
   Elasticity of demand with respect to system attributes.
3. Modeling
   Traffic forecasting models
   Regional routing model
   Microscopic models
4. Externalities
5. Event studies, appointment systems and tradable permits
6. Peer Review
7. Communications

Theory

The primary objective of the research is to develop an equilibrium model that will capture the effects of geographically dispersed suppliers and demanders of different commodities that share or could share the nation's inland waterway system under alternative assumptions about the nature of competition in the industry.

- Dr. Simon Anderson – University of Virginia
- Dr. Wesley Wilson – University of Oregon



Theory

Market Power in Transportation:

- Spatial Equilibrium and Welfare under Cournot Competition
- Spatial Equilibrium and Welfare under Bertrand Competition

Theory

The main objective of this project is to allow for market power and to remove fixed regions in the canonical models. Each of these are considered in this paper with an eye towards evaluating policy actions to improving the transportation sector when both market power and endogenous regions are present. This allows the welfare consequences of improvements to the transportation infrastructure to be explicitly identified.

- Dr. Simon Anderson – University of Virginia
- Dr. Wesley Wilson – University of Oregon

Theory

TRANSPORTATION MARKET EQUILIBRIUM

A Theoretical Approach

Estimating Shipper Response

A series of surveys are being conducted to estimate response to changes in waterway attributes. These include congestion, reliability, rates and travel time. The researchers have surveyed grain shippers on the Upper Mississippi and Columbia Rivers. A related study is looking at coal shippers on the Ohio River.

Dr. Kenneth Train
Dr. Wesley Wilson

Estimating Shipper Response

Two studies have been competed:

- Modeling Preferences for Upper Mississippi Grain Movements: The Mid-American Grain Study
- Transportation Demand in the Columbia-Snake River Basin

Additional studies will be competed on the Ohio and the Upper Mississippi Rivers this year.

Modeling - Forecasting

The forecasting of commodity movements into the future can be dominate factor in estimating benefits of navigation improvements. The NETS research team is developing state of the art techniques for commodity forecasting. These techniques combine spatial equilibrium modeling, risk and uncertainty and scenario analysis.

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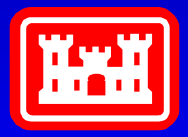
Modeling -World Grain Model

The purpose of this study is to develop a spatial equilibrium model to forecast international commodity flows from a specific region. The methodology will be generally applicable to a broad range of commodities or regions, but the focus will be on the world grain trade and expected market responses to evolving competitive pressures and structural changes.

Dr. William Wilson – North Dakota State University



Container Flow Model

The purpose of this study is to document changes in shipping patterns, both internationally and domestically, and to determine appropriate models for evaluating the impacts on these changes on infrastructure requirements. More specifically, the study will: 1) review previous studies on container shipping with a focus on infrastructure and projections; 2) describe historical movements in world trade; 3)describe and analyze historical movements in US markets as well as the rail market and ocean shipping economies; and 4) review and critique alternative models that can be used to analyze flows, restrictions, expansion possibilities and make projections. In addition, alternatives for handling and quantifying risk will be identified.

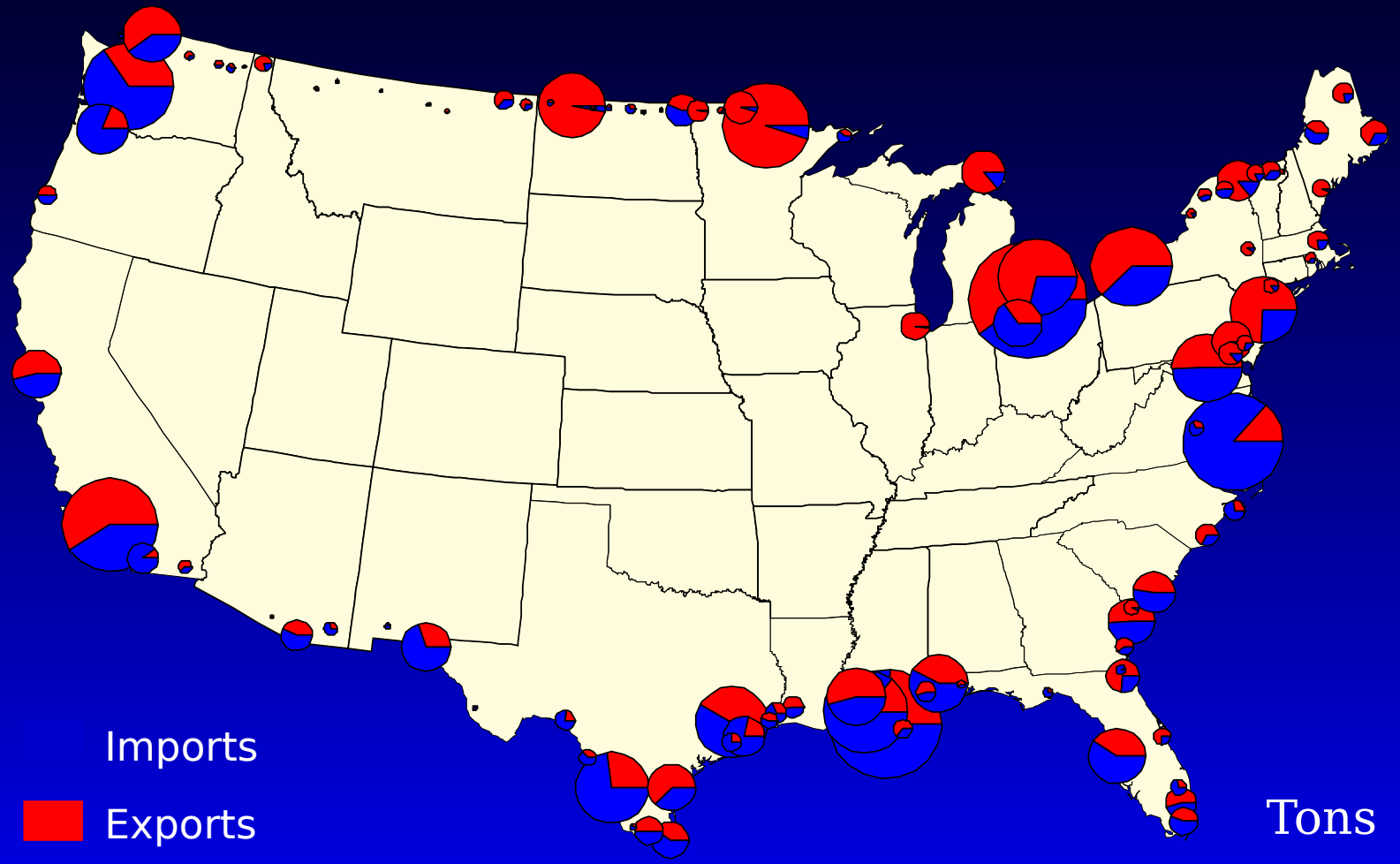
Other Commodity Groups

- Using grain as the “proof of concept” model. This technique will be applied to other commodity groups. Commodity groups to be examined next:
    1. Petroleum
    2. Coal

Modeling - Regional Routing Model

- The aggregate flows from the Global SEM forecasting model will assigned specific routes and modes.
- This will allow the project specific estimate of future traffic.
- Also, the affects to congestion and emission on the overland modes will be possible with this model.

Top Gateways for International Trade for Truck, Rail and Water



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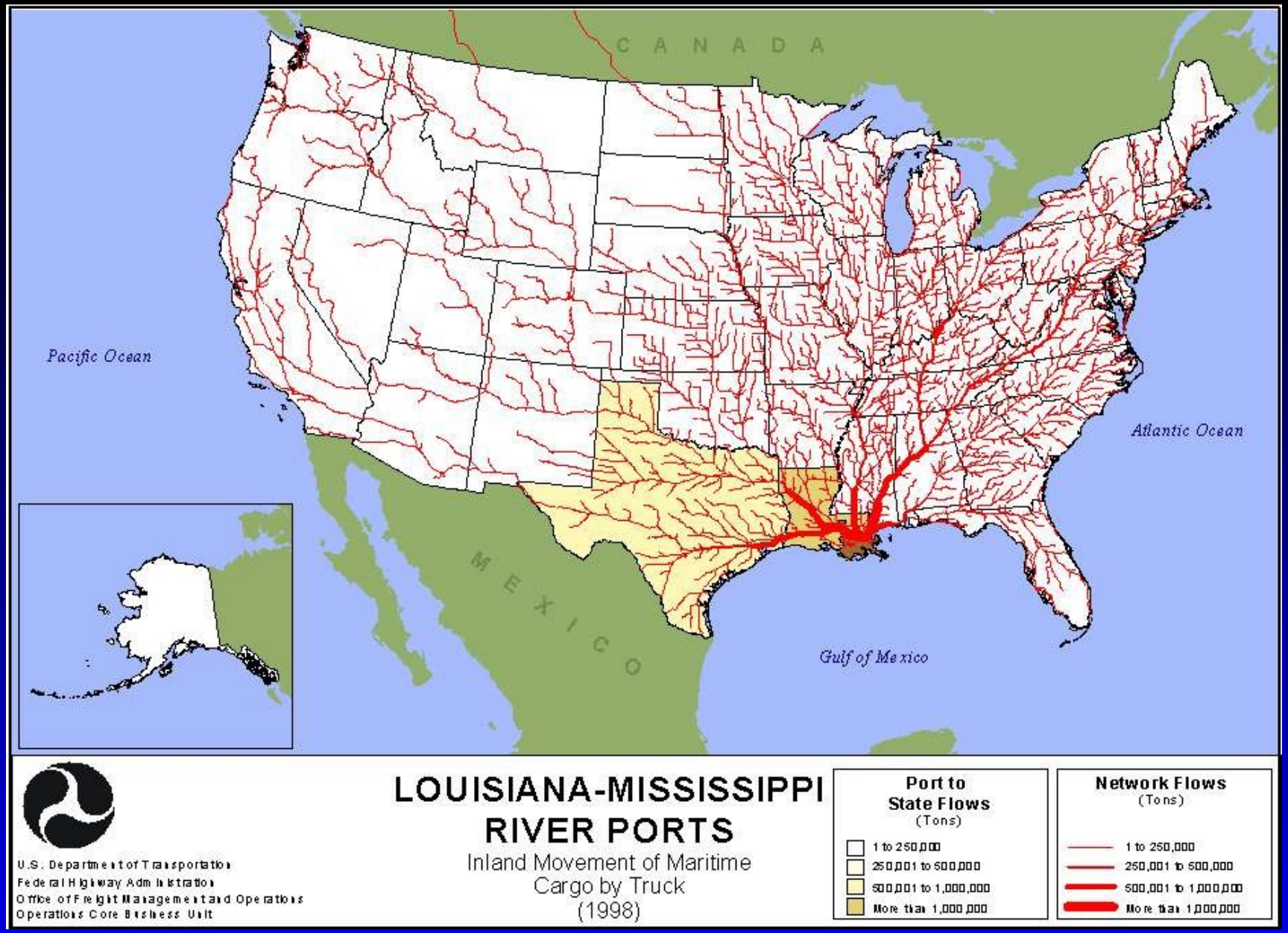

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Microscopic Systems Model

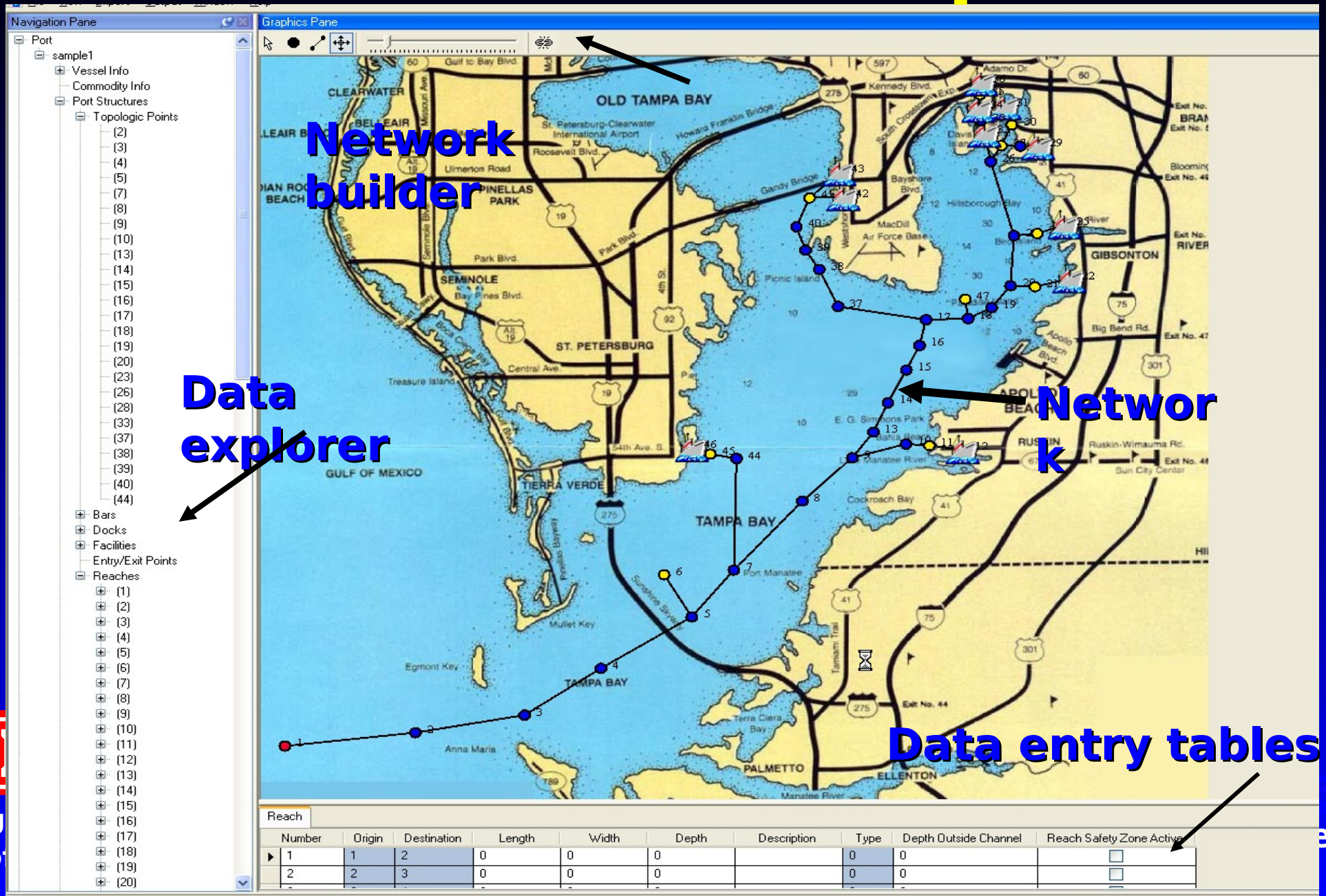
Evaluation of:

- Tradable locking permits
- Scheduling – Appointment system
- Congestion pricing
- Lockage efficiency measures
- Locking policies
- Structural changes that increase capacity.

Microscopic Systems Model

HarborSym – HarborSym is a simulation model that allows planners to analyze the economic impact of channel-widening projects. HarborSym calculates transit times and transportation costs by predicting vessel interactions based on user-provided vessel trip data and harbor transit rule information. Unproductive wait times result when vessels are forced to delay sailing due to transit rules and the movement of other ships within the system. HarborSym captures these delays. Using the model, analysts can calculate changes in transportation costs that will result from proposed modifications of the physical dimensions of the channel. After the widening version of HarborSym is fielded, a version will be developed to calculate the benefits of deepen a channel.

Glass Box Example



Microscopic Systems Model

Navigation System Simulation Model (NaSS) The central focus of this project is to design and build a discrete-event multi-lock simulation model that generates and moves vessels through a network of waterways and locks, with incorporation of scheduled and unscheduled outages and associated shipper response.

Design Document is currently being updated to respond to independent peer review.

Externalities

- Output from the Regional Routing Model will be used to estimate energy required to move the cargo, by mode and region. These energy estimates will be used to create emission profiles by region.
- As alternative improvements are evaluated, how they shift traffic and change the emission profile will be estimated.
- It would be possible to design a system to minimize emissions, in total or by region.

EVENT STUDIES

- Forensic Economic analysis of an event.
- Coordinated and being executed by the LRD Cx for Inland Navigation.
    - Greenup closure
    - McAlpine L&D
    - L&D 27

Tradable Permits

1. Investigating the use of market mechanism to increase the efficiency of the waterway.
   - Dr. Joe Cook – NERA
   - Dr. Charles Plott – Cal Tech

Appointment System

1. NETS is teaming with UMSL-CTS to investigate the potential effectiveness

Independent Peer Review

- An independent peer review process has been established and is being followed for critical research.
  - A list of experts is maintained by the contractor. This list is by area of expertise.
  - When a study is to be reviewed, IWR submits the product and identifies the areas of expertise needed to evaluate the effort.
  - The contract randomly selects from the list and contracts for review. The contractor manages the review.
  - Comments are then submitted anonymously from the contractor to IWR.
- The comments and responses become part of the report and the public record.

Communications

- NETS web site launched in January 2005.
- NETS NEWS!
  - An email alert with summary information about new developments will go out to team members and other interested parties. The email will provide a link to the product on the NETS web site.
- Presentation to interested groups

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US Army Corps of Engineers®

Developing State-of-the-Art Tools and Techniques for Economic Modeling & Analyses to Help Meet Tomorrow's Navigation Challenges

The U.S. Army Corps of Engineers is committed to spending the nation's tax dollars wisely by investing in navigation projects that provide the best value for the dollar long term. The Navigation Economic Technologies (NETS) program supports this mission by developing independently-verified economic models, tools and techniques.

Our web site is designed to provide the latest information on the NETS team, the issues we are addressing, the approaches we are using and the status of our activities. The NETS bookshelf contains final reports and policy guidelines, while the toolbox holds final instruments, models, etc. that result from our research. For regular updates on our progress, sign-up for ***NETS News***, a monthly e-newsletter delivered directly to your inbox.

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Questions?